EXPLANATION OF PLATE V.

Fig. 1. *Acis orientalis*: part of largest specimen, from front, natural size.
Fig. 2. The same: apex of branch, from front, × 8 diam.
Fig. 3. The same: apex of branch, from behind, × 8 diam.
Figs. 4 & 5. The same: cortical fusiform spicules No. 1, × 43 diam.
Fig. 6. The same: cortical squamous spicule No. 2, × 43 diam.
Fig. 7. *Parisis mauritiensis*: lateral branch, nat. size.
Fig. 8. *Muricella perramosa*: terminal branch, nat. size.
Fig. 9. The same: cortical spicule No. 1, × 43 diam.
Fig. 10. The same: cortical spicule No. 2, × 43 diam.

XIV.—*Carcinological Investigation on the Genera* Pemphix, Glyphea, *and* Aræosternus. By T. C. Winkler *.

I. *Introduction* †.

A few months ago Dr. J. G. De Man, Curator at the Museum of Natural History at Leyden, informed me that he

* Translated by W. S. Dallas, F.L.S, from the 'Archives du Musée Teyler,' ser. ii. deuxième partie (1881), pp. 73–124.

† *Literature.*

1822. Brongniart et Desmarest. Histoire Naturelle des Crustacés fossiles.
1822. Schlotheim. Nachträge zur Petrefaktenkunde.
1827. Mantell. Geology of Sussex.
1829. Phillips. Geology of Yorkshire.
1833. H. von Meyer, in Nova Acta Naturæ-Curiosorum, tom. xvi. pars ii.
1834. Milne-Edwards. Histoire Naturelle des Crustacés.
1839. Von Münster. Beiträge zur Petrefaktenkunde.
1839. F. A. Römer. Versteinerungen des norddeutschen Oolithgebirges.
1839. Geinitz. Characteristik des sächsischen Kreidegebirges.
1840. Von Meyer. Neuer Gattungen fossiler Krebse.
1841. F. A. Römer. Versteinerungen des norddeutschen Kreidegebirges.
1842. Deslongchamps, in the Mémoires de la Société Linnéenne de Normandie.
1849. Robineau-Desvoidy, in the Annales de la Société Entomologique de France, 2e serie, tome vii.
1849. M'Coy, in the Annals and Magazine of Natural History, vol. iv.
1850. Dixon. Geology and Fossils of Sussex.
1850. Von Meyer, in the Palæontographica, Band i.
1851. Bronn. Lethæa geognostica.
1852. Milne-Edwards, in the Annales des Sciences Naturelles, 3e série, tome xvii.
1854. Bell, in the Annals and Magazine of Natural History, ser. 2, vol. xiv.
1854. Pictet. Traité de Paléontologie.
1858. Quenstedt. Der Jura.

was engaged in describing a new species of Macrurous Decapod Crustacea, which not only represented a new genus, but at the same time would form, side by side with the Palinuridæ and the Scyllaridæ, a new subfamily of the family Loricata. As he did not know whether there were any genera of fossil Crustacea analogous to or identical with the new genus, M. de Man begged me to compare the latter with the remains of fossil Macrurous Crustacea contained in the palæontological collection of the Musée Teyler. I immediately set to work. I compared with the diagnosis of the new species and the figure of the specimen which were given to me by the above-mentioned naturalist all the examples of fossil Macrurous Crustacea which existed in the museum confided to my care. This comparison, however, did not entirely satisfy me; the Musée Teyler, rich as it may be in fine remains of fossil Crustacea, does not possess all the known species described by those palæontologists who have devoted themselves to carcinological researches. Fortunately the magnificent Teylerian library is at my command. I had to read all that has been written on the Macrurous Crustacea in the works of which a list will be found in the footnote, pp. 133, 134.

This investigation has convinced me that there is certainly no identity between the genus *Arœosternus*, De Man, and any of the genera of Crustacea that lived in the past geological ages. But, although it is different, there is at the same time a very great analogy between this recent genus and the fossil

---

1858. Etallon, in the Bulletin de la Société Géologique de France, 2e série, tome xvi.
1859. Oppel. Der mittlere Lias Schwabens.
1860. Oppel, in the Jahreshefte des Vereins für vaterländischer Naturkunde in Württemberg, Band xvii.
1861. Etallon. Notes sur les Crustacés jurassiques.
1862. Oppel. Palæontologische Mittheilungen.
1864. F. von Alberti. Ueberblick über die Trias.
1867. Quenstedt. Handbuch der Petrefaktenkunde.
1874. Schlüter, in the Verhandlungen des naturhistorischen Vereins des Rheinlands und Westfalens, Band xxxi.
1881. De Man, in Notes from the Leyden Museum.
1881. De Man, in the Tijdschrift voor Entomologie.
1881. Winkler, in the Archives du Musée Teyler, 2e série, tome i.

Besides the works mentioned, the following may be studied:—

Bell. Fossil Malac. Crust. of Great Britain.
Edinburgh Journal, vol. xix.
Dictionnaire des Sciences Naturelles, tom. xxxvii.
Koch und Dunker. Beiträge zur Palæontologie.
F. von Alberti. Gebirge Württembergs.
Neues Jahrbuch (Leonhard und Bronn), 1835, 1836, 1837, 1842, 1849, 1851, 1852, 1853, 1854, 1855, 1857, 1861, 1870, 1874.

genus *Glyphea*. By means of the description of *Arœosternus Wieneckei* and the diagnoses and descriptions of the species of fossil *Glypheæ* which occur in the different palæontological works, I hope to be able to prove what I advance. But, what is more, my investigations have proved to me that the genus *Arœosternus*, De Man, is very probably the existing representative of a very long series of extinct genera—that we may follow the traces of its ancestors through the Tertiary, Cretaceous, and Jurassic periods back to the epoch of the Lower Lias—that there is a series, an uninterrupted succession, which commences with a liassic genus, and terminates in the recent genus—that probably the ancestry of these successive genera, which commence with the liassic *Glypheæ*, must be sought in a geological period anterior to that of the Lias, in the Triassic period, and that this origin of the long series of the *Glypheæ* is to be found in the species described under the name of *Pemphix* (*Palinurus*) *Sueuri*.

In order to demonstrate that my hypothesis is well founded, it is necessary, in the first place, to glance at the genus *Pemphix*, then to give a short historical sketch of the genus *Glyphea*, adding thereto a description of the specimens of that genus contained in the Musée Teyler. After this statement I shall make known the specific characters of *Arœosternus Wieneckei*, De Man. I shall demonstrate that perhaps the *Glypheæ* descend from the genus *Pemphix*; then I shall compare *Arœosternus* with the genus *Glyphea*, pointing out the analogies which unite and the differences which separate these two genera; and, finally, I shall discuss the arguments and considerations which lead me to see in *Arœosternus Wieneckei*, De Man, the last representative of a series of lost forms, the last existing genus of a succession which is probably in course of becoming extinct.

II. *Glance at* Pemphix Sueuri, *von Meyer*.

In 1822 Desmarest gave a description of the carapace of a Macrurous Decapod Crustacean under the name of "Langouste de Lesueur" (*Palinurus Sueuri*). He says that this carapace, which is petrified in calcareous material, is nearly of the size of that of a common crayfish and granular all over; it has a very small triangular rostrum hollowed into a groove, and no spines in front; the rest of the anterior margin is too imperfect to be described. Its surface is divided into three distinct parts by transverse impressed lines, the first of which is not very sinuous, and the second wider, V-shaped and bordered. The first two parts separated by these lines are tuberculous; one of them, the anterior, is the stomachal region, and the second

the genital region. The third part, which corresponds to the position of the branchiæ on each side, is simply granulate; and it is probable that the region of the heart is confounded with it towards the posterior margin, which is sinuous, rounded, and marked with a double projecting line which follows all its contour. The author says that he does not know from what place this fossil comes *.

In 1832 Hermann von Meyer published the description of *Pemphix Sueuri* under the name of *Palinurus Sueuri*, Meyer.

After speaking of the description given by Desmarest and cited above, this author says, "With this species of fossil Crustacean we must unite *Macrourites gibbosus* of Schübler, the remains of which have been found in the upper beds of the Muschelkalk. The specimen described presents some segments of the abdomen and the entire carapace. This carapace is granulate; the tubercles are of the size of a pin's head; most of them occur upon the middle of the cordiform cephalothorax. Upon the middle of the back up to the head is seen a regular impressed line. The surface of the cephalothorax is covered with small tubercles" †.

In 1840 the same author gives a detailed description of *Pemphix Sueuri*, and especially of the furrows and tubercles of the carapace of that Crustacean. The abdomen consists of six segments and of a caudal fin, the median plate of which forms the seventh segment, and two of its lateral plates are divided longitudinally by a median line, while the two outer plates consist of two transverse parts. The outer antennæ are simple, filiform, multiarticulate, and of a length equal to that of the whole body; their peduncle is covered by a finely-striated protective scale. The inner antennæ consist of two terminal filaments, placed upon a peduncle of moderate length. The anterior limbs are much longer and stronger than the others, and bear a pincer, the body of which is stouter than the fingers; the latter are of equal length, conical, and not much curved. The second pair of limbs are smaller and bear chelæ; the third pair are also provided with chelæ. The fifth pair has no chelæ; and the fourth is unknown ‡.

Pictet, in 1854, says :—"The species of *Pemphix* were formerly confounded with the *Palinuri*, from which, however, they differ in many respects. The carapace, instead of being divided only into two parts, is divided into three, of which the anterior corresponds to the stomachal region, the middle one to the greatly developed cardiac and genital regions, and the posterior to the branchial regions. The anterior legs,

* Brongn. et Desm. Hist. Nat. des Crust. foss. p. 132.

† Nova Acta Nat. Cur. tom. xvi. pars ii.

‡ H. von Meyer, Neue Gattungen fossiler Krebse, p. 1.

which are still imperfectly known, differ more from the following legs than in the *Palinuri*. The anterior margin of the carapace is prolonged into a point, and, in particular, into an elongated, lancet-shaped ray *.

Quenstedt, in his 'Handbuch der Petrefaktenkunde,' associates *Pemphix Sueuri* with the Locustina, and describes it under the old name of *Palinurus Sueuri*. He places it therefore among the Macrurous Crustacea of which the first pair of limbs has no pincers. After describing the carapace with its furrows and tubercles, the caudal fin, and the antennæ, the author goes on to say, "The examination of the legs is more difficult. For a long time we knew nothing of them with certainty; but at length, in 1842, Hermann von Meyer gave us some light upon them. According to him the anterior legs are stronger than the others, and terminate in a pincer. Although on examining the figure one is not convinced of the fact, it is nevertheless certain that the following legs bear pincers. In the Muschelkalk of Wiesen, in Switzerland, I found a specimen in which the last joint of the first pair, which, according to von Meyer, should be a pincer, is perfectly preserved; it *terminates only with a claw*, as in the Locustæ"†.

For the purpose which I propose to attain it is not necessary to speak more in detail of *Pemphix Sueuri*; we shall revert to this Crustacean after having studied the genus *Glyphea* and the genus *Arœosternus*.

III. *Historical Sketch of the Genus* Glyphea‡.

In 1822 Desmarest published the description of a fossil Crustacean forming part of the collection in the Paris Museum. He described this specimen under the name of *Palinurus*, and gave the following diagnosis of the genus:—

"Carapace elongate cylindroid, having various regions, especially the stomachal and the branchial, very clearly marked, and presenting anfractuosities and impressed lines in greater number than those of the rest of the other Macrurous Crustacea; lateral antennæ very long and very stout.

"Legs terminated by pointed joints" §.

The specimen was from the limestone of Monte Bolca.

Pictet, in speaking of this specimen, calls it *Palinurus quadricornis*, Desm., although Desmarest gives this name to the common recent *Palinurus* ||.

* Pictet, Traité de Paléontologie, tome ii. p. 444.

† Quenstedt, Handb. der Petref. p. 324.

‡ This "Historical Sketch" has been considerably abridged in the translation.

§ Brongn. et Desm. Hist. Nat. des Crust. foss. p. 131.

|| Pictet, *loc. cit.* p. 443.

In the same year (1822) Desmarest described the "Langouste de Regley," *Palinurus Regleyanus*, Desm. He examined two individuals of this species, both of which are contained in a fragment of rose-coloured limestone of rather coarse grain, forming a sort of rolled pebble as big as one's fist. They were found at the village of Ru, near Vésoul. The author gives the following description of them :—

"In this species the carapace is elongated, compressed, margined at its contours, and covered throughout with rather distant granular points. The stomachal region is slightly angular, and marked above, in its middle, with a line projecting a little in front, but which changes posteriorly into a straight furrow, produced as far as the region of the heart; we see a projecting, granular, longitudinal line on each side of that region ; and near its posterior margin we remark a small transverse furrow also on each side. The great transverse furrow of the carapace, placed behind the region of the stomach, is very strongly marked. The genital region is very wide, and divided into two parts by the impressed longitudinal line which comes from the middle of the stomachal region. Each of these parts has laterally a small transverse impression. The cardiac region is of moderate extent, and of a pentagonal form, marked in the middle with a small raised keel, which is the continuation of the median furrow of the genital and stomachal regions. On each side there is a small, elongate, triangular appendage. The branchial regions, which are very distinct, are separated from each other by a median impressed line, and also from the cardiac and genital regions by another oblique line, which runs to the sides of the carapace at the point where its great transverse furrow terminates"*.

I have thought it desirable to reproduce this description here, because it will be of service to us hereafter in speaking of the genus *Arœosternus*.

Pictet says that *Palinurus Regleyanus*, Desm., is a *Glyphea* †; and on another page of the work quoted the same author says, "*Glyphea Regleyana*, H. von Meyer, *G. vulgaris*, id., *Palinurus Regleyanus*, occurs in the 'terrain à chailles' of the department of the Haute-Saône" ‡.

Milne-Edwards (Hist. Nat. des Crust. ii. p. 302) says that Desmarest refers to *Palinurus* two species of fossil Crustacea, but that he does not accept this view of their affinities. *P. Regleyanus* appears to him to be most nearly related to *Nephrops*.

* Brongn. et Desm. *loc. cit.* p. 132.
† Pictet, Traité de Paléont. tome ii. p. 443.
‡ Pictet, *ibid.* p. 451.

In 1822 also Schlotheim described another fossil Crustacean of his collection under the name of *Macrourites pseudoscyllarus* (Petrefactenkunde, Nachtr. pt. i. p. 36). The specimen was too imperfect for detailed description; but he regarded it as nearly allied to *Scyllarus*, and remarks that although its claws are of a different form, it would appear that it should take its place in that family, seeing that its claws are toothed, at least on one side. The specimen was from Solenhofen.

Twelve years afterwards (1834) Voltz noticed a species of *Palinurus* (*P. Münsteri*) which he saw in the museum of Besançon and in the collection of Count Dressier (Neues Jahrb. 1835, p. 62); and a few months later Hermann von Meyer (Neues Jahrb. 1835, p. 328) stated that he had described and figured the Crustacea from the "terrain à chailles" of Fertignay and elsewhere, previously identified with *Palinurus Regleyanus*. He regarded them as forming three species of a distinct genus, *Glyphea*, viz. *G. vulgaris* (=*Palinurus Regleyanus*, Desm.), *G. speciosa*, and *G. ventrosa*.

In another twelvemonth von Meyer (Neues Jahrb. 1836, p. 56) says that his genus *Glyphea* included five species, namely *G. ventrosa*, *G. Regleyanus*, *G. Münsteri* (previously *G. speciosa*), *G. Dressieri*, and *G. pustulosa*. The first three occur in the "terrain à chailles" of the Haute-Saône, the fourth in the same formation near Besançon, and the fifth in the Bradfordian of Bouxweiler, Bas-Rhin. He adds that it is very remarkable that the Bradfordian form differs less from the most recent of the species of the "terrain à chailles" than some of the latter do from each other.

In 1837 von Meyer records (Neues Jahrb. 1837, p. 314) that Count Münster possessed *Glyphea pustulosa* from the Corallian of Dernebourg and of Wendhausen, near Hildesheim, and also fragments of what seemed to be *G. Dressieri*. The collection at Bayreuth contained a cephalothorax exactly like that of his *G. Mandelslohi* from the Oxfordian of Rabenstein and Thurnau, and from the same formation a fragment belonging to *G. ventrosa* or an allied species. The largest species then known to him was in the possession of M. von Alberti, from the Lower Lias of Frittlingen, near Rothweil; he named it *G. grandis*.

F. A. Römer in 1839 (Verstein. nordd. Ool. p. 51) described two species, namely *G. speciosa* and a new species which he named *G. Bronni*, from the Lower Corallian of Hersum. In the same year (1839) Count Münster described the fossil Crustacea of his collection (Beitr. zur Petref. ii. p. 39), and referred nine species to the genus *Glyphea*, namely:—*G. fusiformis*, Münst.; *G. crassula*, Münst.; *G.*

intermedia, Münst.; *G. elongata*, Münst.; *G. modestiformis*, Münst.; *G. lævigata*, Münst.; *G. minuta*, Münst.; *G. verrucosa*, Münst.; and *G. Veltheimii*, Münst. In his diagnosis of the genus he says that the lateral antennæ are as long as the rest of the body, filiform, multiarticulate, and situated on a peduncle of three joints; the legs of the first pair are long and bear large pincers, generally unequal; the legs of the second and third pairs are slender, long, and terminated by weak didactyle hands, with the outer finger movable; the legs of the fourth and fifth pairs are still more slender, and terminate in a hooked claw, &c. It would appear therefore that the species just named are not *Glypheæ*, as all the limbs in this genus are monodactyle. They were afterwards referred to *Eryma* by H. von Meyer.

On the other hand, true *Glypheæ* were described by Münster as forming his genus *Orphnea*, characterized by having the outer antennæ very long, longer than the rest of the body; the legs of the first pair long and very broad, with a single curved and pointed claw, which meets only a short tubercle; the other pairs of legs also monodactyle; the claws of the fifth pair very long; the carapace shorter than the abdomen, which terminates in five rounded caudal plates. Münster described six species, namely *O. pseudoscyllarus*, *striata*, *lævigata*, and *pygmæa* (all afterwards placed in *Glyphea* under the name of *G. pseudoscyllarus*), *O. squamosa* (now *Glyphea squamosa*), and *O. longimana* (a doubtful species). Pictet (Traité de Pal. ii. p. 447) refers to these species and to Quenstedt's opinion upon them.

In the same work (ii. p. 45) Münster described another genus of Macrurous Crustacea under the name of *Brisa*, allied to *Orphnea*, but having the natatory appendages larger and more rounded, and situated on the sides of the abdomen. The two species *B. lucida* and *B. dubia* were from the lithographic limestone of Bavaria. These forms have since been referred to *Glyphea*.

In 1849 H. von Meyer (Neues Jahrb. 1849, p. 548) met with another species, *G. Hauensteini*, from the freshwater Molasse of Oberbuchsiten, in Switzerland.

In the same year (1849) Robineau-Desvoidy published (Ann. Soc. Ent. Fr. 2e sér. vii. p. 131) a memoir on the Crustacea of the Neocomian of Saint Sauveur-en-Puisaye (Yonne), in which he described thirty species, twenty-seven belonging to the Macrura. A single specimen of *Glyphea* occurred; and the author named it *G. neocomiensis*. It showed only four segments of the abdomen (second to fourth), of which the first two present five deep furrows traversing the whole of the back, separated by elevated lines covered with

sharp tubercles directed forward. The second line is interrupted in the middle. The third and fourth segments have neither the furrows nor the lines.

In 1850 Dixon (Geol. & Foss. of Sussex, p. xv, pl. xxxviii.* fig. 8) published a figure of part of the cephalothorax of a Crustacean, which appears to belong to a *Glyphea*. It is from the Cretaceous beds of Sussex. In the same year H. von Meyer (Palæont. i. p. 141) described, under the name of *Selenisca gratiosa*, a fossil Crustacean from a deposit of the age of the Solenhofen Limestone at Wurmlingen, near Tuttlingen, in Württemberg. He regarded it as allied to *Glyphea*.

In 1851, in his 'Lethæa geognostica' (iv. p. 423), Bronn described the *Glypheæ* as having the anterior limbs terminated by pincers. This is an error, probably due to Phillips (see Jameson's Edinb. Journ. xix. p. 372); but he adds that we must not confound the genus *Glyphea*, Meyer, 1835, with the synonymous genus of Münster, 1839, for the latter of which Meyer, in 1840, proposed the name of *Eryma*. Pictet (Traité de Pal. ii. p. 450), in 1854, seems to have copied Bronn's error.

In 1858 Quenstedt mentions *Glyphea grandis* from the Lower Lias of Frittlingen as probably identical with *Mecochirus grandis* (Der Jura, p. 88). He also (p. 200) mentions a *G. Amalthei*, known only from portions of the pincers (which may belong to *G. liasina*, Meyer), and a *G. numismalis*, Oppel, which is larger and came from the Numismalis marls of Hinterweiler, south of Tübingen (p. 349). Afterwards (p. 391) he describes a pincer found in an iron-mine at Aalen, under the name of *G. aalensis*, and adds that he adopted the name *Glyphea* because it was then in vogue, forgetting apparently that the *Glypheæ* are monodactyle. Elsewhere (p. 549) he refers to the Astacine Crustacea, of which the cephalothorax has two transverse grooves instead of one as in the existing genera; and for this reason, he says, von Meyer gave them the name of *Glyphea* and afterwards that of *Klytia*. He figures *Glyphea bedella* (pl. liii. fig. 5) from Balingen, which he regards as having most analogy with *Klytia ventrosa* of the White Jura. In his description of the Brown Jura (p. 807), Quenstedt refers to some Crustacea from this formation, which he names *Glyphea ornati*, *G. Mandelslohi*, and *Orphnea ornata*. The first two have didactyle pincers, and are not *Glypheæ*. With regard to his *Orphnea ornata* he says, "In the 'Handbuch der Petrefactenkunde,' p. 269, it is shown that von Münster's genus has as its type *Palinurus Regleyanus*, Desm., from the 'terrain à chailles,' and *Macrourites pseudoscyllarus*, Schloth.

Von Meyer, who, in 1835, formed his genus *Glyphea* of these species, afterwards, in the 'Palæontographica,' i. p. 141, figured, under the name of *Selenisca speciosa*, a specimen from the White Jura of Tuttlingen, which seems to approach our *Orphnea ornata*." *Glyphea ventrosa* β, Quenst., according to von Meyer, is a *Klytia*; and *G. Veltheimii*, Quenst., cannot be a *Glyphea*, as he speaks of slender pincers and a long finger.

Also in 1858, Etallon published (Bull. Soc. Géol. Fr. sér. 2, xvi. p. 182) descriptions of the fossil Crustacea of the Haute-Saône and Haut-Jura. The species described by him are for the most part from the "terrain à chailles." He characterized, among others, the genus *Glyphea*, and remarked that, notwithstanding the characters in which it approaches *Pemphix* and *Palinurus*, the external lamina of the antennæ and the mobility of the last segment of the thorax must cause them to be kept with the Astacians. The genus was too much enlarged by Münster, who included in it species now referred to *Clytia* and *Eryma*. Taking as types the species found in the "chailles" of the Haute-Saône, the characteristic forms occur from the Lias to the Kimmeridgian; some species have a wide distribution; and many occur in several stages. Etallon describes *Glyphea Regleyana*, Meyer, *G. Münsteri*, Meyer, *G. rostrata*, M'Coy, and *G. Udressieri*, Meyer—the last identical with *Palinurus squammifer*, E. Desl.

In 1860 Hermann von Meyer* wrote on the subject of Etallon's researches, and discussed some of his results. In the same year appeared Oppel's note on the species of the genera *Glyphea* and *Pseudoglyphea*†, in which he points out that the *Glypheæ* of Münster belong to *Eryma*, Meyer, along with *Aura*, Münst., *Klytia*, Meyer, and *Pustulina*, Quenst., while *Glyphea*, Meyer, includes *Orphnea* and *Brisa*, Münst., and *Selenisca*, Meyer.

This paper was preliminary to a great memoir on the Jurassic Crustacea, published by Oppel in his 'Paläontologische Mittheilungen,' in 1862, in which he fully characterized the genus *Glyphea*, to which he referred the following twenty-four species:—

1. *G. Heeri*, Opp., from the Lias of Schambelen.
2. *G. major*, Opp., with the preceding.
3. *G. alpina*, Opp. Lias of the Alps.
4. *G. liasina*, Meyer.
5. *G. Terquemi*, Opp. Middle Lias, Moselle.

* Neues Jahrb. 1861, p. 73.
† Jahresh. Ver. vaterl. Naturk. Württ. xvii. p. 108.

6. *G. solitaria*, Opp. Inferior Oolite, Württemberg.
7. *G. pustulosa*, Meyer. Inferior Oolite, Württemberg.
8. *G. crassa*, Opp. Inferior Oolite, Moselle.
9. *G. Martini*, Etall. Callovian.
10. *G. ornata*, Quenst. (*Orphnea*). Callovian, Württemberg.
11. *G. Udressieri*, Meyer (incl. *G. Dressieri*, Mey., *Palin. squammifer*, Desm., and *G. Udressieri*, Etall.). Oxfordian.
12. *G. Münsteri*, Voltz (incl. *Palin. Münsteri*, Voltz, *G. speciosa* and *Münsteri*, Mey., *G. speciosa*, Röm., and *G. Münsteri*, Etall.). Oxfordian.
13. *G. Regleyana*, Opp. (incl. *Palin. Regleyanus*, Desm., *G. Regleyana* and *vulgaris*, Mey., *Palin. longebrachiatus*, Desm., and *G. Regleyana*, Etall.). Oxfordian.
14. *G. Bronni*, Röm. Corallian.
15. *G. rostrata*, Phill.
16. *G. Etalloni*, Opp., = *G. rostrata*, Etall.
17. *G. Perroni*, Etall. Corallian.
18. *G. gratiosa*, Meyer (*Selenisca*). Kimmeridge.
19. *G. pseudoscyllarus*, Schl. (incl. *Ast. fluviatilis*, Bajer, *Macrourites pseudoscyllarus*, Schl., *Scyllarus dubius*, Holl, *Orphnea pseudoscyllarus*, *striata*, *lævigata*, and *pygmæa*, and *Brisa dubia* and *lucida*, Münst., *Orphnea pseudoscyllarus* and *striata*, Frischm. Lithographic stone of Solenhofen and Eichstadt.
20. *G. squamosa*, Münster (*Orphnea*). Solenhofen.
21. *G. tenuis*, Opp. Eichstadt.
22. *G. Sœmanni*, Opp. Lithographic stone of Cirin.
23. *G. jurensis*, Opp. Kimmeridge.
24. *G. Meyeri*, Römer.

In 1870 C. Schlüter (Neues Jahrb. 1870, p. 962) noticed *Glyphea Lundgreni* from the Lower Cretaceous of Sweden. Other Cretaceous species are *G. neocomiensis*, R.-Desv., *G. cretacea*, M'Coy, and *G. Carteri*, Bell. Four years later the same author (Verh. naturh. Ver. Rheinl. und Westf. 1874, p. 48) fully described *G. Lundgreni* from Saltholm, in Sweden, which may be identical with a Crustacean figured by Dixon.

IV. *The* Glypheæ *of the Teyler Museum.*

The Teyler Museum possesses ten slabs of the lithographic limestone of Bavaria, seven from Solenhofen, and three from Schernfeld, near Eichstadt, which present more or less complete remains of Macrurous Crustacea. No doubt these fossil

Crustaceans must be ranged in the genus *Glyphea*, and belong to the species named *G. pseudoscyllarus*, Schloth. Among these slabs of stone there are some which show only very mutilated and nearly undecipherable organic remains; but in some of them the animal is preserved in a manner so perfect that it is not difficult to recognize the different parts of the body and to discern the characteristic marks of the species. This fortunate circumstance enables me to make a very complete description of this remarkable species of *Glyphea*; for the parts of the body which are deficient in one slab are frequently admirably preserved upon another.

The cephalothorax is longer than broad; it is covered with tubercles which, on the anterior part, are arranged upon parallel lines, so as to form beaded salient lines, and behind the great transverse furrow are irregularly disseminated. Most of the specimens still present traces of depressions, elevations, and grooves which adorned the carapace during the life of the animal; but in general these characters have been more or less effaced during the fossilization of the body. However, the great deep transverse groove which, on each side of the cephalothorax, is directed towards the median line, and thus forms a semilunar line upon the carapace, separating the stomachal region from the posterior regions, is almost always met with.

The segments of the abdomen appear smooth in most of the specimens; but in some they sometimes present isolated tubercles, and the most perfect specimen in our collection even bears some small tubercles on the seventh segment of the abdomen and on the lateral plates, which, with that segment, form a caudal fin of five lamellæ arranged in a fan. This seventh segment is of a more or less triangular form, being not very wide and narrower behind than in front, while the lateral natatory lamellæ are nearly circular. These external lamellæ are divided transversely; and this division leads one to suppose that these lamellæ were soft and flexible for the posterior third of their length. The first six segments of the abdomen present on each side a triangular lamellar process. It would appear that all these segments, or, at any rate, some of them, bore appendages in the form of small oval lamellæ, which, no doubt, were natatory false feet; one of the specimens in the Teyler Museum presents one of these false feet isolated. The size of this appendage compared with that of the animal would lead one to suppose that this specimen was a female, as we know that in general the appendages of the abdominal segments are much more developed in the females than in the males of existing Crustacea.

The inner antennæ, placed upon a jointed peduncle, are composed of two slender multiarticulate and elongated flagella; the peduncle seems to me to be composed of three joints of a cylindrical form.

The outer antennæ are much stouter and much longer than the inner ones. Their peduncle is composed of two joints, of which the posterior is adorned with several longitudinal series of small tubercles, which, according to M. Oppel, are slender spines. This basal portion of the antenna bears a very long multiarticulate filament. . . . Above the base of the external antennæ there is a pointed movable lamina or protective scale shorter than the peduncle of the antennæ. It appears to me that the surface of this movable scale is perfectly smooth.

The ocular peduncles are very long and broad; they do not seem to be cylindrical as usual, but have the appearance of being almost lamellar. According to M. Oppel the extremity of these peduncles is almost always lost; but the greater part generally exists in its original position and form, although flattened in a certain direction.

None of the specimens at my disposal present any traces of the jaw-feet; consequently I cannot give a description of them; but M. Oppel says that these organs consist of several segments, and that they are digitiform and of a moderate length, equal to that of the movable scale of the outer antennæ.

The legs of the first pair are large and broad and garnished with tubercles and teeth, which are generally situated upon longitudinal lines; their penultimate joint especially is toothed below; the series is composed of about ten sharp teeth, one of which is much larger than the others. These anterior legs terminate in a single pointed and slightly curved finger. This finger also presents some small tubercles, arranged in rows, which give it the aspect of being adorned with prominent beaded lines. It may be, however, that these tubercles are not truly tubercles, but teeth or spines depressed by the pressure undergone by the animal in the beds of limestone which have preserved these remains for us.

The succeeding legs are more slender; and their surface is smooth or presents only a few isolated tubercles. They terminate in a slender and pointed claw; all the five pairs of legs are consequently monodactyle.

In general the size of these Crustaceans is small; they rarely attain a length of more than $1\frac{1}{2}$ to 2 inches.

On comparing our description with the diagnosis of the species established by M. Oppel, it is not difficult to recog-

nize in the specimens described representatives of the species named *Glyphea pseudoscyllarus*, Schl., Oppel.

Most of the examples are adult animals; but among them are two which are undoubtedly young individuals. It is, according to M. Oppel, upon such non-adult individuals of *Glyphea pseudoscyllarus* that von Münster established his genus *Dubima*.

V. *On* Aræosternus Wieneckei, *De Man*.

In order to be able to compare the fossil genus *Glyphea* with the recent genus *Arœosternus*, it is necessary in the first place to give a short summary of the peculiarities of the latter. We must run through the description of the single species of this genus, inserted by Dr. J. G. De Man in the periodical work entitled 'Notes from the Leyden Museum,' vol. iii. M. De Man says:—

This new and very interesting form, to which I propose to give the name of *Arœosternus*, in consequence of its narrow sternum, belongs without any doubt to the family Loricata (Scyllarides, Palinurides). By its generic characters it is a very near ally of the genus *Palinurus*, Fab., the "*Palinuri communes*" of Milne-Edwards; but it differs therefrom so remarkably by the structure of the cephalothorax and the form of the front and the sternum, that it must represent a new subfamily, equal in value to the Scyllarides and the Palinurides. The family Loricata must therefore be divided into three subfamilies, the Scyllarides, Palinurides, and Aræosternides, the last being characterized by the rectangular and narrow sternum and by the structure of the carapace, which is elongated, subcylindrical, and covered with hairs, without spines.

The single specimen, a male, was given to Dr. Wienecke when he visited the Isle of Rats, near Bencoolen, in Sumatra. The person who presented it to the above-mentioned traveller said that he had found the animal in the sea.

The specific characters of *Arœosternus Wieneckei* are as follows:—The cephalothorax is of an elongate rectangular form; its greatest breadth, a little behind the cervical furrow is, in proportion to its length, as 5 to 8; the cervical groove is situated a little behind the middle; the lateral portions of this groove are directed downward and forward towards the anterior part of the antennary sternum; the branchial grooves are very shallow; in front of and parallel to the semilunar posterior margin of the upper surface of the cephalothorax there is a very deep groove.

The front is separated from the outer angles of the carapace by two deep triangular incisions, in which the eyes are situa-

ted. The anterior margin of the front and the outer angles of the orbits are faintly toothed; and on the median line of the anterior part of the front there is a series of a few pointed teeth. The broad and triangular front entirely covers the ophthalmic and antennary segments.

The carapace does not, like that of the *Palinuri*, bear spines; but the whole surface is covered with a multitude of tufts of small hairs, with a few scattered long hairs.

The outer antennæ are formed as in the *Palinuri*, their peduncle uniting with the epistoma. There is no movable scale or protective lamella.

The basal joint of the peduncle is armed with a small spine at the external angle; the upper surface is concave posteriorly and convex anteriorly; the lower surface is convex and a little rough; the inner surface is concave and smooth; the anterior margin of the upper surface is adorned with some yellow hairs. Long hairs cover the second joint of the peduncle, as well as the terminal filament, which is multiarticulate and almost as long as the carapace.

The inner antennæ are situated a little below the outer ones and formed exactly as in the *Palinuri*; their basal joint, the longest of all, extends as far as the middle of the carpocerite of the outer antenna; the second and third joints are of equal length, and are together as long as the first joint; the two terminal filaments are very short; the inner one, which is the longer, is multiarticulate and furnished with hairs on the two margins.

The epistoma is of a transverse rectangular form; its anterior margin is concave, with a median process in the form of a small knob; the concave part is toothed; the other lateral parts of the margin are crenulated; and the outer surface of the epistoma is covered with small tufts of fine hairs.

The outer jaw-feet extend as far as the middle of the carpocerite of the outer antennæ, and are formed as in the *Palinuri*. The third joint of these limbs is of a trapezoidal form, longer than broad; the inner margin of the inner surface is narrow, armed with nine or ten pointed teeth, of which the anterior are the largest; the inner surfaces of all the joints are furnished with a multitude of long yellow hairs.

The sternum is of an elongate and rectangular form. This piece is composed of five segments, of which the first, or anterior, is a little narrower than the second; the second, third, and fourth segments are nearly of equal breadth; while the fifth segment is very narrow, not so wide as the first.

The ambulatory legs are all monodactyle; the first pair is much stronger than the others. The other pairs diminish in

length and breadth in proportion to their distance from the first pair. All the legs are formed like those of the *Palinuri*. The outer surfaces of all the legs are furnished with small tufts of hairs, and the upper and lower margins with very long yellow hairs.

The abdomen resembles that of *Palinurus*; it is a little longer than the carapace. The sixth segment of the abdomen likewise perfectly resembles that of the *Palinuri*; and its lateral appendages form, with the seventh segment, the caudal fin.

The above is a brief summary of the peculiarities of this remarkable Crustacean; for more ample information I refer the reader to M. De Man's memoir. This naturalist, having had the politeness to send me a fine figure of his specimen of *Arœosternus Wieneckei*, accompanied by some remarks, I find myself in a position to add some further particulars to the description inserted in the 'Notes from the Leyden Museum.'

The author writes to me as follows:—"My *Arœosternus* cannot be associated with any existing genus of Macrurous Crustaceans known to me, and this for the following reasons:—It differs from the Carides by the absence of a protective lamella on the peduncle of the outer antennæ, from the Astacides (*Homarus*, *Astacoides*, *Astacus*, *Nephrops*, *Paranephrops*, *Enoplometopus*, &c.) for the same reasons and because all the legs are monodactyle, from the fossil Eryonides for the same reasons; from the Palinurides (*Palinurus*) on account of its non-triangular sternum not widened in the posterior part, and on account of the different structure of the cephalothorax; from the Scyllarides for the reasons mentioned under the Palinurides, and, further, because the outer antennæ are not lamellar; from the anomobranchial Thalassinides (*Callianides* &c.) by the monodactyle feet; from the *Thalassinæ* by the broad and not linear lateral lamellæ of the penultimate segment of the abdomen; from the Callianassides (*Callianassa*, *Trypæa*), because the outer jaw-feet are not lamelliform, and by the monodactyle feet &c.; from the genera *Glaucothoe*, *Laomedia*, *Calocaris*, and *Anius*, which belong to the subbranchial Thalassinides, by the monodactyle feet and several other differences; from the genus *Gebia* by an entirely different habit, by the form of the front, by the eyes being lodged in a sort of orbit, but especially by the structure of the antennæ: in *Gebia* the peduncle of the outer antennæ is composed of several joints, while the flagellum of the inner antennæ is much longer than the peduncle; in *Arœosternus* this part is much stouter than the peduncle.

"Our form must be associated with the family Loricata (Palinurides, Scyllarides) because it presents the characters which distinguish this family from the other group of Macrurous Decapod Crustacea, *i. e.* the absence of a protective lamella, or scale, to the external antennæ, the monodactyle feet, and the structure of the peduncle of the outer antennæ, which is composed of three joints, of which the first two are intimately united with the epistoma, a peculiarity which is met with only in the Loricata. Nevertheless it departs from the Palinurides and the Scyllarides by the non-triangular sternum and by a different habit. It must therefore form a new genus and a new subfamily in the group of the Loricata."

[To be continued.]

XV.—*Descriptions of new Species of Lepidoptera, chiefly from Duke-of-York Island and New Britain.* By Arthur G. Butler, F.L.S., F.Z.S., &c.

[Continued from p. 43.]

18. *Libythea pulchra*, sp. n.

Allied to *L. Geoffroyi* and *L. antipoda*. Wings above bright lilac, the whole disk of the secondaries bright fulvous orange, borders of all the wings narrowly dark brown; veins brown: thorax blue-green, tips of palpi and shoulders brown; abdomen brown, bluish at base, greyish brown spotted with black at the sides. Primaries below ochraceous, apical area brown crossed by a vague band of greyish lilac; borders brown, the costa traversed by darker striations: secondaries rosy lilacine, alternating with four bands of bronze-brown and striated with the same colour: body ashy whitish, the pectus bluish at the sides. Expanse of wings 57 millim.

New Britain.

19. *Curetis solita*, sp. n.

♂. Primaries above dark chocolate-brown, with the lower half of the discoidal cell and a large oval patch confluent with it upon the median interspaces, bright orange: secondaries slightly paler than the primaries, with slight purplish and bronze reflections; an elongate subapical orange spot and a few scales of the same colour beyond the cell: body as usual. Under surface snow-white, with slightly sordid margins and brown fringes to the wings; a few scarcely perceptible slender grey dashes across the disk, and a submarginal series of black dots. Expanse of wings 41 millim.